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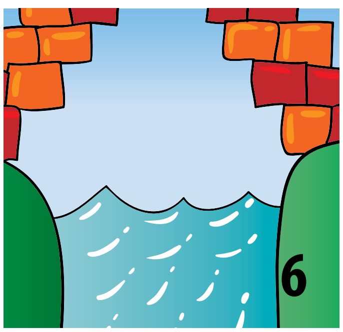


COVER STORY

DEPARTMENTS

FEATURE ARTICLES

Virginia Launches Innovative Hurricane Evac System

A first-of-its-kind hurricane evacuation system is operating in Virginia, and it brings together the technologies of several leaders in the traffic and weather information industries. Digital Traffic Systems, Inc., in partnership with ASTI Transportation Systems, Inc., has deployed six portable detection stations throughout the Commonwealth for use by regional traffic management centers. Each portable station consists of a Wavetronix SmartSensor; an Earthcam video camera; and a Vaisala weather station, all installed on a trailer from ASTI.

"I believe this is the first evacuation system to offer video, weather, vehicle detection and wireless communications all on one portable, solar-powered platform," says Noah Jenkin, ASTI's director of sales.

The system is designed to assist Virginia officials with large-scale traffic movements that might occur in hurricanes and other emergency situations. SmartSensor monitors traffic in each lane, while the Vaisala sensor simultaneously detects weather conditions; the real-time data they gather is sent, along with video images, via wireless modem to ASTI, where it is compiled on a single, easy-to-use Web interface.

The system is the brainchild of Gene Martin, senior ITS engineer with the Virginia Department of Transportation. Martin envisioned the combination of technologies and issued a request for proposals. DTS worked with ASTI to develop their integrated approach.

"This really is a large step forward in the portable detection market," Jenkin says. "It is an excellent example of how collaboration between companies can provide cutting edge solutions to current and future problems."

Jenkin says the system has application beyond hurricane evacuation. Just recently, VDOT experienced a police emergency and was able to use the portable stations to successfully control traffic. "I know there is a need for this type of technology across the country," says Jenkin. "Our job now is to make agencies aware that a powerful system like this exists and is a proven commodity."

ASTI and Wavetronix have partnered together on several portable work zone systems across the country, as well as a large hurricane evacuation system operated by the University of Maryland. ■

Beijing in HD

The city of Beijing, China, has deployed more than 200 SmartSensor HD units in preparation for the 2008 Summer Olympics. Wavetronix shipped 223 SmartSensor HDs to Beijing, which has installed the sensors on Fifth Ring Road, an important route for access to and from Olympic venues. Mike Rose, vice president of sales at Wavetronix, says China selected SmartSensor HD because of its ability to accurately detect vehicle volumes and per vehicle speeds. "HD collects consistently accurate traffic data in high definition," Rose says. "This project brings the number of SmartSensors in China to over 1,000 and marks a significant milestone for high definition radar." China officials say the project will be completed before the Olympics begin in August. ■

DataCollector Reporting Pack Released

An expansion pack is now available for DataCollector 2.2 that offers extended storage capabilities intended primarily for planning groups. The new "Reporting Pack" expands the storage of aggregated data from the standard three months to 12 months and includes two basic planning reports: the Daily Peak report shows the highest volume hour for both the AM and PM periods of a given day, with accompanying average speed and vehicle classification data; the Monthly report provides a summary for an entire time period with total volume, classification data, average speeds and so on. Both reports can be useful, especially for smaller, city- and county-based transportation departments. The expansion is available for both the Desktop and Server editions of Command DataCollector. ■

July 2008	August 2008		September 2008
20–22 IMSA International 113th Annual Conference	**6–8** North American Travel Monitoring Exposition and Conference (NAMTEC)	**17–20** ITE Annual Meeting	**3–5** National Rural ITS Conference

Latest SmartSensor HD Release Available

Wavetronix has released an update to its innovative SmartSensor HD. Version 1.3.1 offers several enhancements to the sensor's high definition performance, including improved performance at shorter offsets. SmartSensor HD can now be mounted higher and still accurately detect traffic in nearer lanes at offsets as short as six feet; higher mounting heights reduce the number of missed detections caused by occluded vehicles. The latest version also improves SmartSensor HD's speed accuracies. SmartSensor HD is the only radar-based detection device capable of providing accurate per vehicle speeds. ■

Utah Intersections Advancing Safety, Efficiency

The Utah Department of Transportation is deploying SmartSensor Advance units at intersections throughout the state. More than 70 sensors have been purchased by UDOT as part of the agency's ongoing efforts to improve intersection safety and efficiency.

Working closely with Wavetronix, UDOT has devised a proactive and sophisticated approach to traffic signal operations, and agency officials call SmartSensor Advance an important part of their intersection program. Wavetronix has helped UDOT fine tune the installation process and has offered training to all involved personnel, from contractors to those overseeing the implementation at UDOT, to ensure a successful deployment of the sensors.

UDOT has deployed SmartSensor Advance at many intersections in the past, but this deployment signifies a new and greater commitment by the state to adopt advance detection technologies at all intersections with speeds greater than 45 miles per hour, including coordinated arterial roads. ■

Work Zone System Deploys in Texas

A work zone detection system in Texas is earning rave reviews. The system utilizes solar-powered Wavetronix SmartSensors installed on portable trailers from ASTI Transportation Systems, Inc., along with ASTI variable message signs. It was deployed over 16 months ago on Interstate 35 in Hillsboro and covers two separate construction projects.

"The primary design was intended for non-recurring events where traffic flow anomalies could be detected and real-time information automatically disseminated to the traveler," says Bradley Miller, a system analyst and ITS coordinator for the Texas Department of Transportation, Waco District.

The system identifies problems and alerts drivers to recommended alternate routes via VMS. Drivers can also be informed of planned lane or total road closures, and the VMS can also be used for 'special content' messages if needed.

According to Miller, the system performance has been impressive. "Public feedback has all been positive," he says. "We intend to deploy other work zone systems on future projects."

More information about the Hillsboro system can be found online at www.wacoIH35hillsboro1.com. ■

The Great Divide

By Brian Hagen

Planning and ITS departments are at odds over how data is collected and used. Can new technology help bring the two worlds together?

The planning and operations sectors of a certain state department of transportation were at war. Tensions between the two groups had been building over many years. Things had become so bad that it was becoming commonplace for each group to cut through the traces of the opposing group's inductive loops when installing their own loops in the same location.

Similar scenarios are playing out across the country, and while this is an extreme example, it serves to illustrate the severity of the situation. Like rival siblings, the rift between planning and operations stems from both proximity and isolation — both groups are close enough in function to occupy the same territory, but just far enough apart in application to have little opportunity for collaboration. They eye each other's resources and budgets with keen interest, and in most cases, they are confident they could manage the other's tasks without too much difficulty.

The result is equivalent to an intra-departmental cold war, with traffic data at the conflict's core. Both groups need accurate data to accomplish their goals, but they need the data in very different forms and they use it in very different ways. Historically, technology hasn't existed which would allow both groups to easily share data, so the only recourse has been a competition for resources, with both planning and operations vying for funding, investing in and then installing their own equipment in order to collect the exact same traffic information. But now, new technologies are emerging that bring the two groups together, allowing them to share data but still use it how and when they need it.

Lengthy History

In the DOT family, intelligent transportation systems are the new baby that gets all the attention. In the past ten years, ITS has become so familiar, most people mistakenly assume that it's been around forever, but the truth is, it's a relative newcomer in the realm of DOT operations.

Data collection for planning departments, on the other hand, has a lengthy history. The deployment of traffic-counting technologies can be traced back 50 years or more, when electro-pneumatic systems became the auto-detection technology of choice; in the mid-1960s and early 1970s, DOTs began deploying embedded, inductive loops for permanent data collection, adopting a technology that would hold a mainstay position in traffic detection for the next forty years.

Not surprisingly, early ITS deployments often selected identical in-ground detection devices — sticking with proven technologies made sense, and the data provided by these devices, though designed specifically for traffic planning and signalized intersection control, was ideal for real-time traffic monitoring and traveler information applications.

The Start of the Conflict

Initially, many departments planned to utilize the same equipment and share the data they collected. In the mid-1990s, the Utah Department of Transportation embarked on a massive project to reconstruct Interstate 15 through Salt Lake City in preparation for the 2002 Winter Olympics. Lee Theobald, supervisor of UDOT's Traffic Monitoring Program, says the planning department lost several permanent counting stations on I-15 but were told not to worry. "When it came time to replace them, ITS was going to be the answer," Theobald says. "They were going to be putting in millions of dollars worth of equipment, and we were told we could just get the information from them."

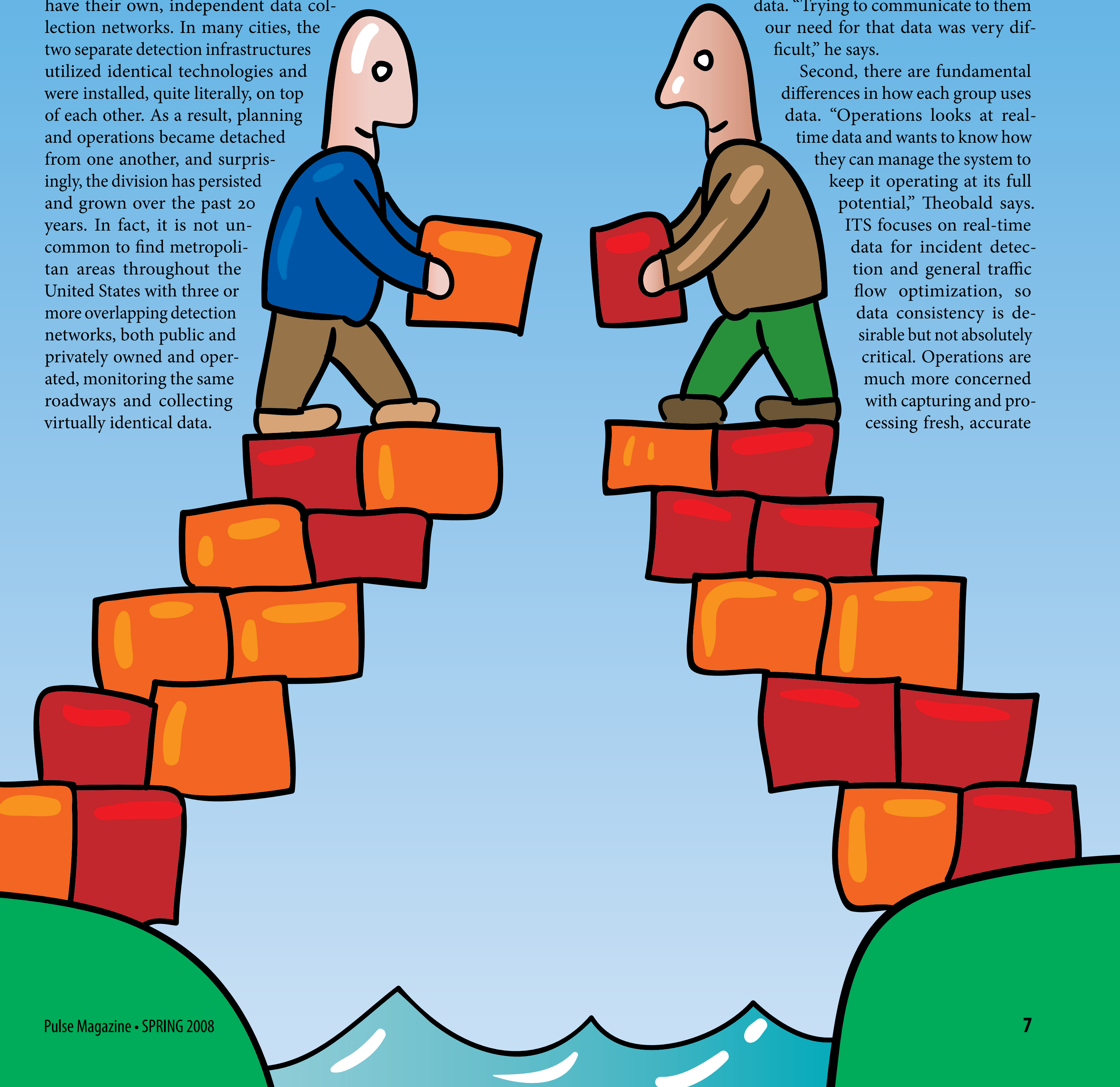
But actually putting that plan into practice proved difficult. Loops lack the ability to communicate with multiple systems at the same time, so in the early days of ITS, it was logical for planning and operations to have their own, independent data collection networks. In many cities, the two separate detection infrastructures utilized identical technologies and were installed, quite literally, on top of each other. As a result, planning and operations became detached from one another, and surprisingly, the division has persisted and grown over the past 20 years. In fact, it is not uncommon to find metropolitan areas throughout the United States with three or more overlapping detection networks, both public and privately owned and operated, monitoring the same roadways and collecting virtually identical data.

Data Divide

So why can't the two groups simply access and share the data from a single network of detection devices? Theobald believes there are a couple of reasons. First, he says, it's a simple communication problem. "In our agency, it began as a territorial thing," he explains. "The ITS group had the attitude that it was their investment, they put in the equipment, so it was theirs, and helping out the planning department wasn't part of their plan."

Similar scenarios have been seen in other DOTs with similar results. To make matters even worse, each responsible group jealously guards their assets while keeping a wary eye on the opposing parties and their competing systems. For UDOT, data ownership became a real issue, and Theobald says it was up to the operations group to share the data. "Trying to communicate to them our need for that data was very difficult," he says.

Second, there are fundamental differences in how each group uses data. "Operations looks at real-time data and wants to know how they can manage the system to keep it operating at its full potential," Theobald says. ITS focuses on real-time data for incident detection and general traffic flow optimization, so data consistency is desirable but not absolutely critical. Operations are much more concerned with capturing and processing fresh, accurate



speed and volume data as frequently as every 20 to 30 seconds, and delivering it just as rapidly to real-time data processing subsystems.

Other transportation professionals agree. "Operations don't care about time-stamped data," says Paul Stein, manager of traffic data systems at the Wisconsin Department of Transportation. "Their mission is to keep traffic moving, and if they have enough data to do that, then they're happy."

But planning requires complete data sets that are time-stamped to the minute the data was collected. "Planning needs all the data it can get from the entire day, every day," Stein says. Planning groups operate in a non-real time environment, using daily and monthly aggregated data for statistical analysis and federal reporting purposes; inconsistent or unreliable data negates the value of those applications. Additionally, the data granularity requirements of each group differ: planning reports and analyses regularly need 5-, 15- or 60-minute aggregated data bins with speeds, volumes and a broad number of vehicle classes similarly binned into logical groupings. For planning, accuracy and consistency are key, not the freshness of the data. Says Theobald, "Planning looks at historical data, whether it's from yesterday or 20 years ago, to try and predict future needs."

It's no wonder, then, that these two groups have historically deployed redundant, and somewhat uncooperative, systems. Although the technologies they employ are usually identical, their methods, timing and end-use applications have dictated a need for largely autonomous networks and systems. Overlapping resources and competition for funding have fueled the conflict in state DOTs across the country, but Stein quickly points out that not all tensions come from internal sources.

"At Wisconsin DOT, the biggest problem is not with either group, it's with consultants or people at the federal level that believe we should be able to just take the data operations uses and simply pipe it into our system," Stein says. "Because of the differences in the data we all need, that just isn't the case."

New Opportunities

There are three distinct aspects to an effective shared environment: vehicle detection; data networking; and data processing. In the years since the great divide between planning and operations began, these systems have advanced and diversified. First, there have been great advancements made in detection technologies. Until very recently, loops were the only sensor technology that truly met the needs of both planning and ITS, but the cost of installing and maintaining loop systems has become prohibitive for many state agencies. Now, in addition to in-ground detection, a growing catalog of non-intrusive, roadside-mounted devices has been introduced, offering a range of detection capabilities that include video cameras, acoustic devices and radar-based sensors that can all be installed and maintained at a fraction of loops' cost.

Unfortunately, few of these non-intrusive technologies have presented an opportunity to bring planning and ITS together; most non-intrusive detectors have been targeted to the growing ITS market and simply do not deliver the level of detail needed for planning analysis and reporting. Consequently, the chasm between the two groups has widened. However, as these devices improve, providing increased accuracy, reliability and resolution, perhaps this one obstacle to cooperation between planning and ITS can finally be resolved.

Advances in data networking also have been introduced, with both wired and wireless digital Ethernet topologies replacing the older contact-closure and serial data systems that were deployed for many decades. These advances bring greater reliability and consistency to traffic data and pose the first real opportunity for planning and ITS to share resources. But adoption of these technologies has been slow; although a single, shared communication network makes sense, the cost of retrofitting old, dial-up data logging devices with Internet Protocol communication interfaces has caused many states to postpone the transition.

The final piece to a shared environment is the collection, management and distribution of data. Historically, the industry has built solutions around each specific function with no overlap, and this has served to further widen the gap between planning and operations. Typical data management systems have been custom-built by contracted consultants — moving data in and out of these proprietary environments has been difficult; effectively moving real-time data has been all but impossible. But improvements have been made, and several reliable systems are now available that greatly simplify the process. UDOT, for example, is employing a data archiving system that gives the planning group access to the data it needs without compromising the needs of operations.

Blended Processes and Shared Results

Arguably, it would be optimal for every state DOT to have shared sensors, networks and data processing environments. The cost and operational benefits from such collaboration could be enormous. In terms of optimized expenses in system deployments and subsequent maintenance, traffic professionals like Lee Theobald recognize the value of shared resources. "When we reconstructed I-15, if UDOT had done everything with everyone in mind, there probably would have been significant cost savings," Lee Theobald says.

Operationally, sensor data that is collected and processed every thirty seconds can easily be stored in a networked database and used for multiple purposes. Old systems that held this data in inaccessible, proprietary formats are being retired and replaced with open, manageable databases. Under these new system architectures, data is routinely used by traffic monitoring algorithms for traveler information systems, congestion control and incident response; the same raw data is also available for planning analysis and reporting. With so many new opportunities, could a truce between planning and ITS be far behind?

A Collaborative Future

In the past, the Federal Highway Administration encouraged collaboration and defined specific standards for data sharing programs. Public-private enterprises have attempted to bridge the gap between planning and ITS, and several of these partnerships have been heralded as industry successes. But federal programs ultimately will do little to solve the issues that keep planning and ITS from working together. In fact, there is evidence to suggest that federal expectations of collaboration, with no real effort to address the key issues, are actually fostering the divisions that lead to inefficiency.

As always, real changes will be industry-driven. As technologies continue to advance, new opportunities for cooperation will be discovered. Several key advances in recent years have brought planning and ITS closer together: a new generation of non-intrusive sensors that provide the level of data detail, accuracy and reliability critical to both groups; fast, reliable network interfaces, including the choice of wired or wireless connectivity, that allow each group to get the data they want when they want it, over the same network infrastructure; and consolidated back-end data processing environments that can manage the collection of real-time data and aggregate, calculate and distribute that data into useful formats. The needs of both groups can truly be met under this technologically collaborative, yet operationally autonomous, environment.

To jumpstart the collaboration process, though, individual agencies can accomplish a lot with some good old fashioned communication. According to Paul Stein, Wisconsin DOT hasn't experienced the same level of tension between groups as other state DOTs because leadership has fostered an environment of communication. "We talk to each other, and actually addressed a number of these issues before they became a problem," Stein says. "We work together because we've taken the time to understand each other."

Theobald says his agency is on its way there, and reiterates that lack of communication that has led to the rift between planning and ITS at UDOT. "I remember one situation where both groups shared loops at a certain location. Operations put in new, above-ground radar sensors and disconnected the loops without telling us," he says. "As a result, we lost data. There is still a perception that we'll just get the data from operations, but it's not happening yet." There is hope, though, he says. "It's getting better. We're working together to find a solution. I feel like, in a short time frame, we'll be sharing workable information." ■

Brian Hagen is Executive Vice-president and Chief Operating Officer at Wavetronix.

Planning and ITS view the same traffic differently. New technologies give each group access to the specific data it needs from a single, shared network of data collection devices.

Bridging the Gap

By Reggie Gardner

With Command data management products, ITS and planning departments can access the same data and use it any way they need it.

The conflict between planning departments and traffic operations stems in part from the inability of both groups to easily access the data they need in just the form they require. Operations look for accurate, real-time information that can be used immediately in traveler information systems, congestion management and incident response applications; planning, however, needs consistent, accurate data that shows historical trends in order to create long-term growth projections. In the past, these different data needs have resulted in each group investing in and implementing their own separate systems, an expensive and ineffective solution that has only served to widen the divide that exists between these two important groups.

One effective way to bridge the gap between planning and ITS is to implement comprehensive data processing systems like the Command line from Wavetronix. Command appliances manage the collection of real-time data from a single, shared sensor network; they also translate the raw data into the formats required by traveler information systems and planning reports and analyses. As stand-alone products, each Command appliance is designed to do a specific job, from data collection and translation to network health monitoring and reporting; together, the Command suite forms the ideal traffic data management solution that can be used simultaneously by both ITS and planning.

Data Collection

The Command DataCollector is designed to meet the needs of both planning and ITS, providing the real-time data needed by operations and the accurate, complete data sets sought after by planning. DataCollector manages complete sensor networks and stores information about each individual sensor in its database, including device type, specific communication properties, interval information and collection frequencies. With this information, DataCollector can retrieve data from each sensor whenever it's needed, from every 20 seconds to once a day at user-specified times.

When retrieving data from the sensors, DataCollector places the highest priority on the most recent data in order to get real-time information immediately to the applications that need it, such as traveler information systems. But it also provides gap-free data; if a sensor has on-board data buffers that can be accessed by its interface protocol, then once the latest interval is retrieved, DataCollector will query the sensor for any data it may not have been able to collect previously. As a result, ITS gets the real-time data it needs first, and any holes in the data are filled in over time to give planning groups the complete data sets they require.

Data Flow

The raw data retrieved from each sensor is stored in a relational database for one week; it is also aggregated into 5-, 15- and 60-minutes bins where it can be stored for up to three months. So in addition to getting real-time data, any person or system with proper authorization can access the data they need at any time. The stored data includes traffic information as well as sensor configuration information.

To keep data flowing to relevant systems, DataCollector provides a real-time data feed that can be read by any interested application. To further improve this flow of data, Wavetronix offers the Command DataTranslator appliance, which can be used to automatically move traffic data from DataCollector to appropriate third-party systems. DataTranslator converts raw data into the formats required by ITS for Web-based traffic maps, 511 telephone systems, highway advisory radio, and travel time information that can be displayed on variable message signs; it can also translate data into the formats required by planning groups for traffic reporting and analysis. DataTranslator's functions are user-controlled and can be customized to meet the specific needs of any individual department or agency.

Driver Library

DataCollector uses a software driver system that enables it to communicate with practically any traffic detection device. If a driver for a given device doesn't exist, then one can easily be created and added to the system. The current library supports devices that are commonly used by both ITS and planning systems.

Networks

Ideally, ITS and planning departments will share in-the-field devices and infrastructure, including communication networks. However, this often is not the case, as each group typically installs and maintains its own systems. DataCollector is designed to manage the data collection process in environments like this as well. DataCollector can communicate with sensors over dial-up or any TCP/IP network, and adjustments can be made to each sensor's settings that will enable communication through difficult and complicated networks.

Data Integrity

One thing both operations and planning systems have in common is the need for reliable, accurate data. The Command DataMonitor appliance is a tool that analyzes sensor data in order to protect data integrity and ensure the health of entire data collection networks. First, DataMonitor verifies the quality of retrieved data and monitors overall system health. No system can function properly for either group if data is not being received or if collected data does not meet quality standards. DataMonitor checks data as it is collected, and notifies interested users if a problem is detected: perhaps power to a specific sensor has failed; or perhaps a sensor in the field is reporting invalid data and needs to be recalibrated. Often, technicians are notified of problems within minutes of the problem occurring, by email or pop-up desktop alerts. This enables technicians responsible for large networks to know immediately if there are any issues that require attention.

Second, DataMonitor looks for data that might suggest traffic anomalies like congestion or incidents. Traffic operators are notified of potential problems and can know immediately where to look in the network, enabling them to respond more quickly to problems that can affect traffic flow. With this type of an automation tool in place, the quality and availability of data increases, which enables both ITS and planning groups to perform at a higher level.

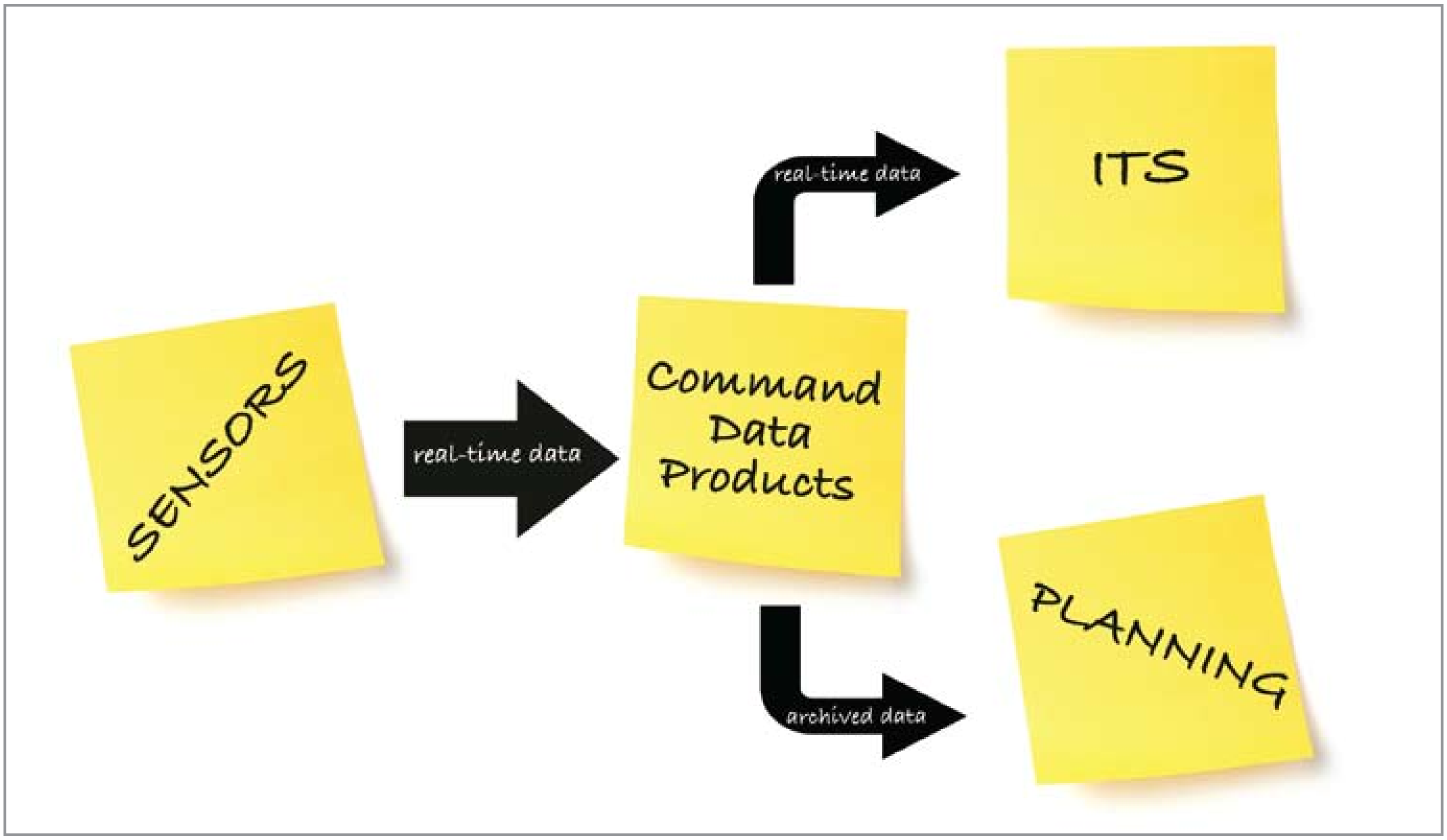
New Product

Recently, Wavetronix added a new appliance to the Command line that was designed specifically for planning groups. Command DataView offers advanced data analysis and reporting, making it easy for planning engineers to load data from a variety of sources, such as DataCollector or PRN files, and then prepare that data for reporting and analysis.

Intelligent systems like Command make it easy for departments of transportation to create shared systems that meet the needs of both ITS and planning. Command bridges the data gap between these groups by allowing agencies to combine resources, and by ensuring the quality and frequency of the data needed by both groups to accomplish their unique missions. The result is more effective, more affordable traffic management. ■

Reggie Gardner is a software developer at Wavetronix. He currently serves as the product manager for the Command line of data appliances. He joined Wavetronix in 2004 and has over eight years experience in his field.

▼ **Command products help keep data flowing. ITS gets the real-time data it needs for management and response, while planning gets the complete, time-stamped data sets it needs for reporting and analysis.**



Radar Revolution

by Don Leavitt

Recent testing shows how SmartSensor HD is leading the advancement of radar detection technologies for use in modern traffic monitoring systems.

When it comes to effective traffic monitoring and management, it's all about the data. From traveler information to traffic planning and analysis, data is driving today's intelligent transportation applications. As these systems have grown more sophisticated, the need for consistently accurate, reliable data has increased, leading to an evolution in traffic detection technologies.

The sensors generating that data are the heart of any intelligent traffic system. If a sensor is prone to failures, then the entire system will suffer from missing data; if a sensor is consistently inaccurate, or is only accurate under specific conditions, then the rest of the system will be flawed.

SmartSensor HD represents the latest advancement in the evolution of radar traffic detection, and recent testing proves HD's accuracy, even in difficult detection conditions. For the first time, intelligent transportation systems are reaping the benefits of increased detection resolution from a high RF bandwidth; the accurate per vehicle speed measurements of a unique, dual radar design; and the true extended detection range of SmartSensor HD's powerful RF receiver.

Embracing Radar

Traditional, embedded technologies like inductive loops remain a popular choice, but non-intrusive devices like SmartSensor HD are gaining ground for use in traffic monitoring systems.

"Transportation agencies are discovering the reliability of above-ground sensors," says Thomas Karlinsey, a senior engineer at Wavetronix. "Non-intrusive devices cost less to install and maintain than devices that are embedded in the roadway."

There are several different non-intrusive technologies available, but Karlinsey says radar remains the most popular because of its effectiveness in all weather and lighting conditions. Still, some agencies have been slow to adopt radar. "There is a perception that radar is not as accurate as loops," he says.

This may have been true with first generation radar devices that appeared in the traffic monitoring market more than 15 years ago, but according to Karlinsey, second generation devices like Wavetronix' original SmartSensor have consistently performed as well as loops in third-party testing. "And SmartSensor HD, which represents the third generation of this technology, offers several new capabilities that consistently exceed the performance expectations of today's advanced monitoring systems," Karlinsey says.

Detection Resolution

SmartSensor HD offers a high RF bandwidth that Karlinsey says translates directly into increased detection resolution.

"Side-fire radar sensors like SmartSensor HD transmit frequency modulated, continuous wave signals," says Karlinsey, "and signal returns are processed to create distance measurements of target vehicles on the roadway."

Bandwidth determines the accuracy of that distance measurement. Karlinsey says, "At low bandwidths, the radar processing can confuse a single, large vehicle for two vehicles traveling side by side," an effect known as "spillover." By increasing the bandwidth of the transmit signal, the detection accuracy of the radar sensor improves.

SmartSensor HD transmits at 250 MHz, five times the bandwidth of other radar sensors on the market, and its improved detection accuracy is evident in testing: a 2007 study by the Florida A&M University-Florida State University College of Engineering found SmartSensor HD had 98.8 percent detection accuracies; in 2006, the Adroscoggin Transportation Resource Center compared SmartSensor HD to automatic traffic recorders and found the radar to have 98.4 percent accuracies; and in Texas, SmartSensor HD had 98.9 percent accuracies compared to inductive loops, according to data collected from a Texas Transportation Institute test bed.

Prior to SmartSensor HD, Karlinsey says radar sensors typically had problems with detection accuracy in certain locations. "Sound walls cause a ricochet effect to radar signals, creating false detections," he explains. "Also, high percentages of truck traffic can occlude other vehicles and cause detection spillover." However, SmartSensor HD has been shown to provide a high level of detection accuracy even in these types of environments. At one particularly difficult location that included both a sound wall and more than 40 percent truck traffic in three out of five lanes, SmartSensor HD still achieved detection accuracies of 96.3 percent.

Dual Radar

While most radar sensors estimate speeds based on the average speed of several vehicles, SmartSensor HD is the first radar device that can produce highly accurate per vehicle speeds comparable to embedded technologies.

"SmartSensor HD contains two receive antennas separated by a small distance," Karlinsey explains. "This dual radar forms a radar speed trap that measures the time it takes for a vehicle to pass to within a fraction of a millisecond. It then calculates the speed of the detected vehicle."

In July 2006, SmartSensor HD's dual radar speed measurements were put to the test against a well-calibrated piezo system. The results showed that 92.3 percent of the speeds reported by SmartSensor HD fell within +/- five miles per hour of the speeds measured by the piezo system.

In addition, SmartSensor HD features 15 speed bins that create a measure of the distribution of speeds present on the roadway. "These bins of accurate, per vehicle data can then be used by traffic operations centers, police agencies or planning departments for response and analysis," Karlinsey says.

Extended Range

According to Karlinsey, all radar systems are limited by the maximum distance at which vehicles can be detected. The contrast between strong radar returns from targets at near ranges and the weaker returns from targets at farther ranges can pose a problem for radar receivers. The range of strong to weak signals that can be detected by a radar receiver is referred to as the receiver's "dynamic range."

"The maximum transmit power of radar sensors is regulated, so improvements to the maximum detectable range of a sensor can only be gained by improving the radar receiver," Karlinsey says. "SmartSensor HD uses high-end digital receiver hardware that extends its dynamic range to 250 feet, enabling the sensor to detect vehicles at both near and far ranges."

Additional Benefits

Vehicle length measurements made by radar sensors are calculated by multiplying the time a vehicle is in the radar beam by the vehicle's speed. Therefore, the accuracy of the length measurement depends upon the accuracy of both factors. SmartSensor HD's accurate per vehicle speed data, combined with the sensor's innovative detection algorithms, provides the most accurate vehicle length measurements of any radar traffic device.

This, in turn, enables SmartSensor HD to provide something previous generations of radar sensors could not – accurate vehicle classifications. Recent tests have proven HD's advanced classification performance: a Minnesota Department of Transportation study (SRF NO. 6076) found that the individual vehicle classifications made by HD and an automatic traffic recorder matched well, with a correlation coefficient of 85 percent; meanwhile, the FAMU-FSU College of Engineering study found that SmartSensor HD correctly classified 94.9 percent of all vehicles, with average accuracies of 98.3 percent; and data from the TTI test bed showed HD correctly classified 85 percent of all vehicles, with average accuracies of 96.3 percent.

Additionally, Karlinsey says SmartSensor HD "features eight length-based classification bins, which measure the distribution of vehicle sizes on a given road." While eight bins may be more than is necessary in length-based classification systems, four-bin systems are currently used in many states and are referenced in the Federal Highway Administration's Traffic Monitoring Guide. Earlier generations of radar detection provided adequate classification but were seldom used for classification applications because they did not meet federal specifications.

The value of consistently accurate data increases as modern traffic monitoring systems grow more sophisticated. SmartSensor HD's proven performance and advanced capabilities have helped to improve systems around the world, making them more efficient and making SmartSensor HD an invaluable part of intelligent transportation. ■

Solar Powered

by Bruce Gould

How SunWize solar energy systems are powering SmartSensor deployments in Indiana.

When the Indiana Department of Transportation began deploying its TrafficWise ITS system, it faced a problem common at many ITS installations: how to cost effectively bring reliable power to individual roadside devices. For Indiana, the solution was simple — SunWize solar energy systems.

TrafficWise ITS addresses non-recurring congestion in three areas of the state, including metropolitan Indianapolis. The primary element of the INDOT program is an advanced traffic management system that combines 106 Wavetronix SmartSensors with 49 video cameras; together, these devices will monitor traffic for slowdowns caused by crashes, rush hour buildup and work zones. By focusing on these issues, INDOT hopes to save motorists 10 to 25 percent of their travel time while simultaneously reducing the number of accidents.

The work of installing the TrafficWise network was performed by Meade Electric of Illinois, and their subsidiary, Traffic Control Corporation, an authorized Wavetronix dealer. At first glance, it seemed that providing power to the cameras and SmartSensors was a non-issue, especially near Indianapolis where commercial grid power is prevalent. However, installers encountered several instances where that power was an appreciable distance from the desired installation site.

At those locations, INDOT was faced with a decision: bring power to each site, a task that can be prohibitively expensive; or move each site to a secondary, less favorable location closer to existing power, and risk compromising the value of the detection data, which in turn would decrease the value of the ATMS network overall.

Neither option appealed to INDOT, but SunWize, Meade Electric and TCC were able to offer the agency a third choice: solar, or photovoltaic, electricity. SunWize Technologies, a subsidiary of Mitsui & Co., Inc. (USA), specializes in the production of solar energy systems. Headquartered in New York, SunWize offers fully integrated solar power supplies and design services that include site analysis and installation supervision. SunWize presented INDOT with a solution that was easy to use, reliable and cost effective, allowing the agency to bring solar power to the installation sites that would provide the most effective traffic information.

Easy to Use

With SunWize photovoltaic (PV) systems, power is located where you need it. In Indiana, SunWize® Power Ready Systems are installed alongside the SmartSensors they are powering, with battery storage and PV controllers contained on-site in a common enclosure. For INDOT, it is the ideal distributed power source, sized specifically for SmartSensor and the solar levels available at the sites in question. And SunWize PV systems are pre-assembled prior to shipment, so INDOT received complete, pre-tested equipment ready for installation.

Reliable

SunWize believes that a well-designed, standalone PV system is the most reliable form of power available for remote-site equipment. Because of the inherent battery autonomy designed into it, a PV system provides all-day power that is not susceptible to power outages.

For INDOT, SunWize used extensive databases to determine local solar radiation levels, and used that information to create the solar array and battery sizes INDOT would need to power each SmartSensor. The end result was verified using sophisticated statistical analyses that consider hundreds of weather iterations to ensure that the system would perform reliably at all times.

In addition, SunWize has designed their PV systems to be as easy to maintain as possible. INDOT will perform a simple, annual system check to test mechanical and electrical connections, but no additional maintenance is required. Occasionally, INDOT may need to clear unusual debris from the PV array, but because the SunWize PV array is self-cleaning, the occurrence of unusual debris will be rare.

Cost Effective

The cost of a standalone PV system is proportional to the PV array and battery bank size, which in turn is proportional to the load it is powering. When a PV system powers a high efficiency piece of equipment like SmartSensor, the result is an extremely cost effective PV system relative to grid extension.

For Indiana, most sites had a load of just 2.2 amps continuous at a nominal 12VDC — roughly 26 watts. SunWize provided a PV system using four 110 watt, 12VDC PV modules wired in parallel, and a 750 amp-hour battery bank, at a fraction of what it would have cost INDOT to extend their power grid by a mile.

SunWize provided INDOT with a simple, cost effective solution, allowing the agency to bring power to SmartSensors located too far from commercial power sources. Easy to use and reliable, INDOT has found PV to be an elegant technology for devices like SmartSensor that have a modest load requirement. In comparison to the challenges it faced, INDOT discovered that SunWize and SmartSensor are a hard combination to beat. ■

Bruce Gould is the senior vice president of SunWize Technologies' Industrial Power Group. He has more than 20 years' experience in the field of solar energy, and holds a Bachelor of Science degree in Electrical Engineering from the University of New Hampshire.

▲ SunWize PV system powering a SmartSensor HD

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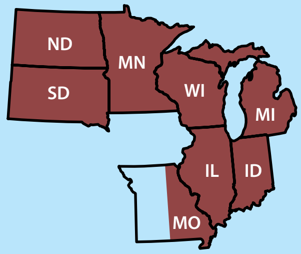

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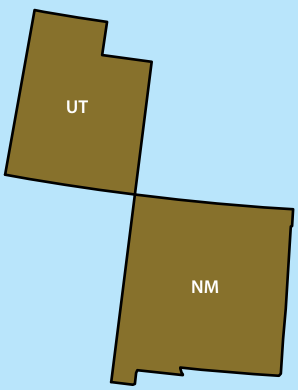

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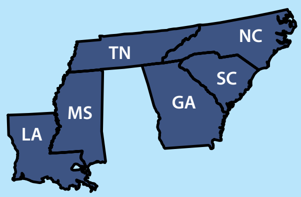

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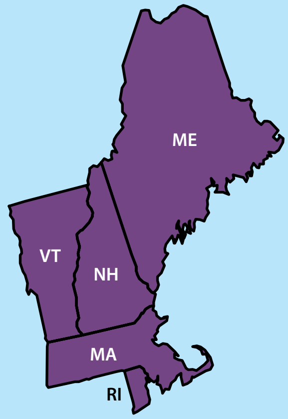

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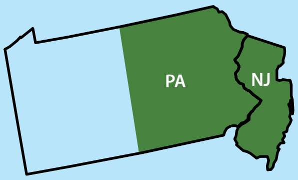

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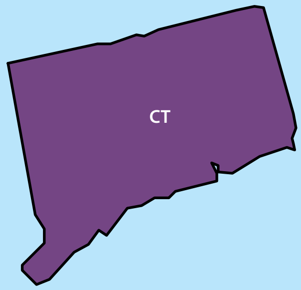

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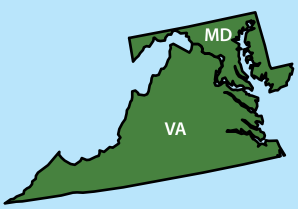

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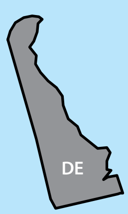

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